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BIOLOGICAL EVALUATION OF PEST CONDITIONS ON THE VALYERMO AND TUJUNGA RANGER DISTRICTS, ANGELES NATIONAL FOREST

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ABSTRACT

We evaluated pest conditions at several sites on the Valyermo and Tujunga Ranger Districts with Alan Wright, Angeles Timber Management Specialist. Pinyon pines at Devil's Punchbowl County Park began dying in 1982 following attacks by twig beetles and the pinyon ips; contributing factors included drought, soil compaction, brush competition, and pinyon dwarf mistletoe. At Little Rock Station, all of the planted incense-cedars died one year after a wildfire burned around the station, subjecting the trees to severe heat injury. On Mount Gleason, fire injury and drought predisposed ponderosa pines to attack by the western pine beetle. In a mixed conifer-hardwood plantation at Big Tujunga Dam, pines and other conifers were growing poorly because they were not adapted to the site and had suffered severe competition on the well-drained, nutrient-poor soil. At several sites on the Forest, we observed mortality caused by true mistletoe in hardwoods. Management alternatives are presented for the pest conditions described.

On March 15, 1983, we met with Alan Wright, Angeles Timber Management Specialist, and accompanied him to several sites on the Forest where pest problems had been reported. We visited Devil's Punchbowl County Park and Little Rock Station on the Valyermo Ranger District, and Mount Gleason and Big Tujunga Dam on the Tujunga Ranger District. We also discussed several management alternatives for true mistletoe on hardwoods.

DEVIL'S PUNCHBOWL COUNTY PARK

The Devil's Punchbowl County Park is located on 40 acres owned by the County of Los Angeles and, under a Special Use Permit, on an adjoining

1,200 acres of the Valyermo Ranger District. A museum and picnic area have been built on the County-owned parcel, while the rest of the Park is undeveloped except for trails. The Park is in the San Andreas Rift Zone, in the foothills between the San Gabriel Mountains and the Mojave Desert. The major tree species is singleleaf pinyon pine which occurs at basal areas of 20 to 80 square feet per acre. Some of the individual trees in the picnic area are over 18 inches dbh. Scrub oak, flannel bush, grass, and yerba santa are present in places.

Pinyon pine began to die in the Park during 1982. Local managers became concerned about further tree mortality, as the site receives heavy recreation use. Dave Numer, County Park Biologist, accompanied us on our examination of the site.

OBSERVATIONS

Scattered individuals and small groups of pinyon pine had died throughout the area. Many of the living trees were in a state of decline. Twig beetles, Pityophthorus sp., had infested the twigs and small branches, causing the mortality to proceed inward into the crown.

Trees which had a large proportion of the crown killed by twig beetles were subsequently attacked and killed by the pinyon ips, Ips confusus. Several stress-causing factors present in the Park would have allowed the large number of trees to be infested by the beetles.

The soil in the root zone of many of the pinyon pines in the picnic area was compacted, apparently by people seeking shade. The only trees in the picnic area around which the soil was not compacted were surrounded by dense brush or flannel bush, which compete with the trees for moisture. Competition from scrub oak, brush, and grass was quite common in the areas outside the picnic area. An additional stress factor found outside the picnic area was pinyon dwarf mistletoe, Arceuthobium divaricatum. All types of vegetation in the area had been subjected to moisture stress in the recent past. The average of the precipitation received at three stations near the Park for the 19-month period from June 1980 through December 1981 was 56 percent of normal.

DISCUSSION

The average precipitation at the Park is around 15 inches per year, which is adequate to support the native vegetation in its natural state. Much of the vegetation in the Park, however, is not in a truly natural state. Fire control has allowed the proliferation of many types of vegetation which compete with the pinyon pine. In addition, the soil has been compacted by visitors in some areas and volunteer trails have caused erosion in others. The result has been a general decline of the mature pinyon pine and lack of reproduction. As a result of the decline in vigor of the pinyon pine and the recent moisture deficit, some of the trees succumbed to insects which normally breed in suppressed branches and slash.

The current mortality is the result of insect attacks that occurred during 1982. Although the precipitation was generally adequate during

1982, the trees were probably still under moisture stress because time is necessary to regenerate the branch and root tips that die back in response to drought. Precipitation was more than adequate during the winter of 1982-83 and consequently there should be little additional mortality during 1983.

MANAGEMENT ALTERNATIVES

Do Nothing. If there is no change in the Park management and if the future weather pattern is similar to the past, then the vigor of the remaining pinyon pine will continue to decline and mortality will occur during future dry periods. Because there are few pinyon pine seedlings to replace the older trees as they die, it is likely that pinyon pine will become less common in the future. The dead pinyon pine and the ingrowth of grass and brush will increase the fire hazard.

Protect Trees in the Picnic Area.

1) When a recognized stress such as drought or fire is affecting the trees, they can be protected from attack by the pinyon ips by applying an insecticide to the main stem of the tree. Sevimol 4 carbaryl insecticide will protect the parts of a pine tree to which it is applied from attack by bark beetles. It would probably have a minimal effect on the twig beetles due to the difficulty of applying it to twigs. An application during 1983 is unlikely to produce any noticeable difference, because the abundant winter precipitation should have relieved most of the moisture stress.

2) Supplemental watering during prolonged dry periods can help maintain enough vigor to ward off insect attacks. Injecting the water 1-2 feet deep into the root zone and allowing the soil to dry between waterings is most likely to benefit the tree without stimulating Armillaria root rot.

3) Removing the brush and flannel bush around the pinyon pines would help conserve the soil moisture. It would also allow easier access to some of the trees, which could increase soil compaction if mitigating measures are not taken.

4) Future soil compaction around the trees could probably be reduced by using physical improvements in the picnic area. Fences around the trees would reduce much of the traffic but could cause resentment, even if signs explained the purpose. The amount of compaction in the area immediately around the larger trees could be reduced by constructing circular or hexagonal picnic tables which surround the tree trunk. It is also possible that some visitors could be encouraged to spend less time near the trees if the current picnic tables were moved to open areas and artifical sun shades were constructed.

Perpetuate Pinyon Pine Outside Picnic Area.

1) Accessible areas which have become unstocked or understocked with pinyon pine due to recent mortality could be replanted. If there is no site preparation or maintenance, survival may be low; even so, planting could help maintain pinyon pine as at least a component of the area.

2) The vegetation competing with established pinyon pine in accessible areas could be controlled by various combinations of hand cutting, grubbing, girdling, and the use of herbicides. The increase in vigor should prolong the lives of established trees.

3) Prescribed buring could be used in some areas to open up the stands, reduce the amount of vegetation and lower the amount of fuel in the area. The amount of live and dead fuel will tend to increase with time if no action is taken. Given the location, history, and use pattern of the Park, it is highly likely that an unplanned fire will occur at some point in the future.

LITTLE ROCK STATION

All of the pole-size incense-cedar in a planted area near the Station had died, and we were asked to determine the cause. The trees had been infested by flatheaded borers and cedar bark beetles (Phloeosinus spp.), and the root systems of several were poorly developed. However, the predisposing cause of death was probably a fire that burned around the Station in 1981. The fire generated enough heat to damage the crowns of several cottonwoods and an Arizona cypress growing along the fence near the dead trees. Although the incense-cedars were not burned directly, they had been planted close to the fence and were probably injured severely by the heat. The young, thin-barked incense-cedars would have been more susceptible to cambium kill than nearby, older hardwoods and conifers.

MOUNT GLEASON PLANTATIONS

Steve Windward, formerly of the Tujunga Ranger District, sent FPM a detection report in May 1982, reporting a swelling of the bole on Coulter pines 18-20 years old in a plantation on Mount Gleason. He had observed that the 2nd-year whorl of branches was fading to brown, and was concerned whether an insect or disease pest might be the cause. We examined several plantations in the Mount Gleason area, but were unable to find the symptom he had reported. In general, the planted Coulter pines appeared healthy, particularly where they had been hand-released from brush. Until the exact location is discovered, we are as baffled as Steve was about the cause or importance of the damage.

MOUNT GLEASON FIRE SALVAGE AREA

The top of Mount Gleason is about 6,500 ft. elevation and supports one of the few stands of mature timber on the Tujunga Ranger District. The stand is mostly old-growth ponderosa pine and incense-cedar with bigcone Douglas-fir in the lower draws. Most of the ponderosa pine are flat-topped and resemble a Dunning risk class 5 because of advanced age and wind.

The 1979 Sage Burn caused extensive damage on the lower slopes of the mountain and scorched trees almost to the summit. Fire-stressed trees on the lower slopes have been attacked and killed by bark beetles over the past few years, but were inaccessible to local woodcutters. Following the dry period during 1980 and 1981, the western pine beetle, Dendroctonus brevicomis, began to kill fire-scorched ponderosa pine at higher elevations on the mountain. Some of the dead trees are within 100 yards of the road and they may be salvaged.

The stand on Mount Gleason is not being managed for timber because there are few markets for the wood and one of the access roads to Messenger Flats and Lightning Point campgrounds passes through it. The objective for the area is to perpetuate the stand. There is a small amount of natural regeneration, but recent mortality has left some holes in the stand. Little mortality should occur during 1983 because adequate winter precipitation has increased tree vigor, but additional mortality should be expected during future dry years. It is unlikely that the current stand structure and species composition can be maintained if the policy of fire exclusion and limited vegetation management continues.

MANAGEMENT ALTERNATIVES

Do Nothing. The background mortality in the stand will be high because many of the ponderosa pine are old and there is considerable competition. During periods of stress such as drought the mortality will accelerate. If poor ponderosa pine seed crops or competition from grass and brush prevent the establishment of seedlings, then ponderosa pine will assume less importance in the stand. Nearby areas suggest that if fire is excluded and no vegetation management is undertaken, the future stand on Mount Gleason will be predominantly hardwoods and brush.

Clearcut Stand and Replant. Extensive plantations on Mount Gleason indicate this alternative is biologically feasible. Accurate records of ~~the number of times the~~ plantations were cleared, planted, brushed, and thinned do not exist, but it is assumed that considerable effort was invested. It may not be possible to duplicate the results of these earlier plantations during an era of declining budgets and reduced work forces.

Remove High Risk Trees, Sanitize Stand, and Salvage Mortality. Much of the overstory is overmature sawtimber which have either flat-topped crowns or old top kills. The few trees in the smaller size classes appear to be fairly old trees that have been suppressed for a long time.

Large fire scars are common on the trees in the area. A rigorous application of this treatment would strongly resemble the previous Alternative.

Salvage Dead Trees, Maintain Present Stand, and Regenerate Aggregations. Salvaging the current mortality would lower the fuel load, slightly increase the amount of light available for natural or planted regeneration, and allow for the orderly removal of the dead trees which might otherwise damage some of the residual stand or regeneration when they eventually fall. Some small aggregations are densely stocked for the site and condition of the trees. Removing a few of the most suppressed, damaged, or decadent trees would improve the vigor of the remaining trees by making more light and water available; it would also remove the trees most likely to become the center of a bark beetle mortality spot. More water and nutrients could also be made available to the conifers by reducing competition from grass, brush, and hardwoods. The stand could be perpetuated by planting seedlings grown from locally collected seed in the openings that result from mortality of the older trees. The survival and growth rate as well as the ease of planting and the ability to keep track of the plantations would probably be improved by enlarging natural openings to several acres before beginning site preparation.

BIG TUJUNGA DAM

Big Tujunga Dam is operated by the Los Angeles County Flood Control District under a Special Use Permit on the Tujunga Ranger District. The County had proposed the use of a miticide during 1983 to control spider mites on trees planted near the dam.

OBSERVATIONS AND DISCUSSION

Big Tujunga Dam is about 2,300 feet elevation. The vegetation in the canyon is primarily brush with a few native hardwood trees. An area that had been filled below the dam was planted with trees to stablize the fill. The species planted about 10 to 15 years ago included Arizona cypress, Aleppo pine, incense-cedar, deodar cedar, and live oak. Piped water is available at the site and the plantings were probably watered in the past. The area has seeded in with grass, forbs, yerba santa, Scotch broom, and yucca.

Several pines in the area had short, off-color foliage. No insect, mite, or disease problems could be detected on the pines. The cause of the malady seems to be heavy competition on an excessively well drained and nutrient-poor soil. One deodar cedar was almost dead, but its condition seemed to be the result of the bole being heavily scorched by fire in the past. Low numbers of whitefly puparia, spittlebug nymphs, and spider mites were found on the leaves of several live oaks, but there was no apparent injury to the trees.

Because the planting site below the dam is several thousand feet lower than the elevation at which conifers naturally occur in the area, it is unreasonable to expect planted conifers to survive there without peri-

odic maintenance. Even if the trees survive, their appearance may not be satisfactory because the fill material seems to be deficient in some nutrients.

Because there is limited public access to the area and the main function of the trees seems to be to stablize the fill, their appearance may not be important. If there are no other overriding needs to maintain the trees, such as for recreation or wildlife, the simplest approach would be to allow the brush to take over the site. Brush would require little maintenance and the root systems are likely to occupy more of the area than the roots of a conifer plantation would.

MANAGEMENT ALTERNATIVES

Do Nothing. The planted conifers will continue to decline in health and vigor as competition from the brush and between the trees increases with time. Some trees will eventually be attacked and killed by bark beetles. Brush and yucca will dominate the site.

Control Insects and Mites. The low-level infestation of whiteflies, spittlebugs, and spider mites on three live oak trees would probably be reduced even further by an application of a combination of an insecticide and miticide. This would require an investment of time and money and would result in no change in the health, growth or appearance of the trees. A Pesticide-Use Proposal and an Environmental Assessment would be required for the project because the site is on federally-owned land.

Maintain Current Plantation. Controlling competition from brush and grass would probably bring about the greatest improvement in appearance and vigor of the planted trees, although the reduction in total root mass may be counterproductive to maintaining fill stability. Moderate amounts of fertilization and watering would also be beneficial to maintaining the trees. Some degree of thinning will be necessary in the future to maintain vigor, and some trees will have to be removed to avoid interference with overhead power lines.

TRUE MISTLETOE IN HARDWOODS

We looked at a site near the Forest where true mistletoe (Phoradendron sp.) was severely affecting cottonwood and sycamore. Al Wright noted that this condition occurs in several campgrounds on the Forest, and wondered whether there are any feasible treatments. We discussed several management alternatives.

PARASITE BIOLOGY

Two species of Phoradendron commonly attack hardwoods on the Angeles National Forest. P. villosum occurs almost exclusively on oaks, although manzanita, buckeye, and black locust are occasionally infected. Mature leaves are somewhat stiff and hairy, and are approximately 0.6-1.8 inches long by 0.4-0.9 inches wide. P. macrophylum infects some 60 hardwood species of about 30 genera, including cottonwood, willow, poplar, black locust, maple, walnut, alder, and sycamore; it does not

attack oaks. Mature leaves are slightly hairy; they are usually more than 1.1 inches long by 0.7 inches wide, and about twice as large as those of P. villosum.

Like the dwarf mistletoes, the true mistletoes are flowering plants that require a living host to survive. They are generally less demanding of their hosts than the dwarf mistletoes, yet can be serious pests where individual trees are of high value, as in parks and campgrounds. Although they are completely parasitic, they produce many of their required nutrients by photosynthesis and usually require only water and minerals from their hosts. However, if the green aerial shoots of the mistletoe are removed, the parasite's root system can utilize the host's nutrients and remain alive within an infected branch for many years.

Mistletoe infections are spread mainly by birds--including robins, bluebirds, thrushes, and cedar waxwings--that feed on the berries. Birds digest the pulp of the berries and excrete the living seeds, often depositing them onto susceptible trees. A viscous coating and hair-like threads on the outer surface of the seeds attach them firmly to twigs and branches, where they germinate and infect the host tissues.

Young or small trees are seldom infected by true mistletoes. In nearly all cases, initial infection occurs on larger or older trees because birds prefer to perch in their tops. Severe buildup of mistletoe often occurs in an already-infected tree because birds are attracted to the mistletoe berries and may spend prolonged periods feeding on them.

The damage caused by true mistletoes usually outweighs whatever economic or aesthetic value they may have. Severely infected trees are weakened, reduced in growth rate, and sometimes killed. Weakened trees are predisposed to attack by insects and often succumb to drought or other stresses. Branches heavily-laden with mistletoe may break during storms or high winds, and trunk swellings may provide entry to decay fungi, increasing the hazard to people and property in developed sites.

MANAGEMENT ALTERNATIVES

Take No Action. True mistletoe will continue to intensify on its hosts, and many of the presently uninfected but susceptible hardwoods may eventually be attacked. Overhanging limbs with large mistletoe-induced swellings will pose an increasing hazard to visitors. Growth will be reduced in the most severely-infected trees, and many will develop thin crowns, grow more susceptible to drought, and die prematurely. Although there is little information on how much severe infection reduces the longevity of a hardwood, there are many examples on the Angeles National Forest of trees that were extensively infected before they died.

Prune Infected Branches. Where possible, prune infected limbs one foot or more below the point of mistletoe attachment or visible swelling, preferably at the bole or at the nearest crotch. Because of long-range spread by birds, pruning will not eradicate the mistletoe. However, since the parasite often takes 5-10 years to develop to damaging proportions, re-treatment will not be necessary for several years. Prune carefully to avoid excessive damage to the host and to prevent decay; in

general, do not prune branches larger than 4-6 inches in diameter, as large wounds will heal slowly and usually become extensively decayed. Treating pruning cuts with commercial preparations does not prevent decay.

Remove Mistletoe Plants. Removing mistletoe foliage will reduce some of the parasite's drain on the host, and may reduce local infection rates by eliminating the seed-bearing plants that attract birds. Shoot removal is labor-intensive and must be repeated every 2-3 years.

Wrap Infected Branches. Cut off the mistletoe plant flush with the limb or bole. Wrap the severed point with a band of black plastic wide enough to exclude light, and tie the plastic to the limb with twine or flexible tape. Since mistletoe cannot survive without light, it may die within a year or two. However, this method is time-consuming and not particularly effective: prevention of shoots is often only temporary, and the wrappings are unsightly; the limb may be heat-damaged, and callus tissue may form under the wrappings; the wrappings may provide a refuge for insects or decay fungi that further damage the host.

Treat Chemically. A mixture of 2,4-D and dicamba is currently registered for mistletoe control (Super D Weedone Foam Weed Control). Prune the mistletoe shoot to a 1.5-3.0 inch stub and cover it with the herbicide. If the mistletoe plants are less than three inches in height, apply the foam to the entire plant. Do not apply the herbicide to host limbs smaller than one inch in diameter, and be careful to apply only enough to cover the mistletoe tissue. Re-treatment may be necessary if the mistletoe resprouts or new infections occur; control must be repeated at least every 2-3 years to eliminate latent or new infections. Apply herbicide after leaf fall and before leaf buds develop in the spring; otherwise, the host or nearby trees may be damaged. The treatment is not advisable for live oaks or wherever evergreen trees and shrubs may be affected by the herbicide dripping from above.

(All pesticide uses for insect and disease projects must receive prior approval, based on a Pesticide Use Proposal [FS-2100-2] submitted with an environmental assessment to the Regional Forester. Procedural details are described in the Forest Service Manual.)

Plant Replacement Trees. Establishing a mixture of species will minimize host-specific pest problems and add diversity to a site. Unlike the native California sycamore, the London plane is a rare host of Phoradendron macrophyllum and may help reduce the severity of a mistletoe infestation. Where large, severely infected hardwoods predominate, interplant with either susceptible or non-susceptible young trees to provide a replacement stand that should not become severely infected for several years, since the mistletoe-spreading birds prefer to perch in the tallest crowns. Once the replacement stand is well-established, the worst infected and weakest older trees may be removed and new infections pruned.